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Publication date:
2019

Document Version
Early version, also known as pre-print

CentER

Discussion Paper

No. 2019-024

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8 July 2019

ISSN 0924-7815
ISSN 2213-9532

TILBURG UNIVERSITY

Dutch Shell Companies and International Tax Planning

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Abstract

This paper uses the financial statements of special purpose entities (SPEs) for explaining the origin and destination of dividend, interest, and royalty flows passing the Netherlands. We find that Bermuda is the most important destination for royalty flows. These flows come from Ireland, Singapore and the United States. For dividend and interest payments the geographical pattern is more widespread. We find a substantial tax reduction for royalties by using Dutch SPEs compared to a direct flow between the origin and destination country. However, we cannot find such tax savings for dividends and interest with an approximation based on statutory tax rates. When controlling for country characteristics in our regression analysis we do find that tax differentials partially explain the geographical patterns of income flows diverted through the Netherlands. This is the case for the likelihood that a route is used, as well as for the size of the flows. This paper is one of the first using bilateral income flows as dependent variables instead of bilateral FDI stocks or flows.

Key words: corporate taxation, international tax planning, treaty shopping, bilateral dividend flows, bilateral interest flows, bilateral royalty flows

JEL classification: G32 · H25 · H32

The authors appreciate discussions with Ed Westerhout in an earlier stage of the paper. The authors are grateful to Krit Carlier and Albert Termeulen of the Dutch Central Bank for providing the data and fruitful discussions. The authors have also benefitted from comments by Leon Bettendorf, Michael Overesch, Marcel Olbert, Dirk Schindler and Johannes Voget, and the participants at the NTA in New Orleans, 15-17 November 2018, the CPB Tax Haven workshop in The Hague, 23-24 January 2019, a seminar at the university of Vienna, 13 February 2019, and the ZEW Public finance conference, 2-3 May 2019.

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1 Introduction

Tax avoidance and evasion are high on the policy agenda, also in the Netherlands. The Dutch rank high on international FDI (foreign direct investment) positions; for inward and outward positions they are in the top 3, together with the United States and Luxembourg, holding about 15% of the global FDI stock. The FDI positions amount to five times GDP and about 80 percent of these FDI positions is on the balance sheets of Special Purpose Entities (SPEs) or shell companies. Recently, the Netherlands is classified as a top conduit country (European Commission, 2017). The Dutch SPEs are crucial for the investment and income flows passing through the Netherlands.

Although there are various papers in the literature identifying conduit countries[1] the underlying structures at the micro level are less investigated. This is also the case for the vast literature on international tax avoidance. A large part of the estimates on international tax avoidance is derived from macro aggregates, e.g. Torslov et al. (2018). What is missing are analyses at the firm level, in particular using the primary income flows. Except for studies with the Bundesbanks' MiDi database on German multinationals[2], there is hardly empirical material in this respect. This paper intends to fill this gap. We have the opportunity to use firm level data from SPEs, covering the incoming and outgoing income flows and debt and equity positions. By using these data we try to find out whether the conduit role of the Netherlands is indeed motivated by the international tax system. And if so, what are the tax planning gains of using Dutch SPEs?

First, the paper describes the geographical pattern of incoming and outgoing income flows of Dutch SPEs. For all country pairs, we construct bilateral flows of dividends, interest and royalties that are diverted via the Netherlands, by linking incoming and outgoing flows within SPEs that belong to the same owner. Second, these flows are combined with bilateral tax parameters to estimate the importance of fiscal motives for these flows. This also allows us to estimate the tax planning gains involved with the diversion of income flows through the Netherlands. Third, we examine to what extent tax parameters are indeed determinants for both the likelihood that a route is used and for the size of the flow.

We have data for about the ten percent largest SPEs in the Netherlands between 2004 and 2016, representing two thirds to 80 percent of all foreign assets of Dutch SPEs in these years. SPEs are required to report monthly their transactions and balance sheet items by geographic relation to the Dutch central bank (DNB). It contains dividend, royalty and interest flows, both incoming to and outgoing from the Netherlands, for the immediate countries of origin and destination.

Publicly available macro data show a large increase in FDI, consisting of foreign equity and loans, in these years, from 1,500 to 4,200 billion euro. In our sample the increase is somewhat lower but still impressive; from 1,200 billion euro in 2004 to 2,900 billion euro in

[1] Garcia -Bernardo et al. (2017), Hong (2018), Mintz (2004), Van 't Riet and Lejour (2018), Weyzig (2013), among others.
[2] Mintz and Weichenrieder (2010).

2016. The most important flows are dividends. The size of outgoing dividend is 51 billion euro and of incoming dividend is 77 billion euro on average in 2014-2016. A part of the incoming dividend is used for new loans and foreign investments. The incoming and outgoing royalty flows are 26 and 28 billion euro on average in 2014-2016.

We find that almost all royalties come from Ireland, Singapore and the United States and go to Bermuda and the United States. For interest and dividend the geographical distribution is somewhat broader, although about 60 percent of dividends and about 45% of interest goes to multinationals in the US, UK, Switzerland and Luxembourg. Besides these countries, dividend also flows to other European countries and to some tax havens. The source of dividend and interest is really multilateral: from the US, tax havens and European conduit countries. It suggests that the Netherlands is but one link in chains of complex financial flows.

We develop a measure for tax planning gain and apply this to the relevant income flows to and from the SPEs. We distinguish between a direct and an indirect tax gain. The direct planning gain occurs when interest and royalty flows, which are tax deductible in the country of origin, are taxed at a lower rate in the destination country. The indirect gain may arise in a conduit situation; we compare the tax burden on direct routes, without passing the Netherlands, and the tax burden on indirect routes via the Netherlands, see also Hong (2018) and van 't Riet and Lejour (2018). We label this tax differential as the treaty shopping gain.

For measuring the direct planning gain and the treaty shopping gain, we use the relevant tax variables, such as withholding taxes, corporate tax rates, double tax relief methods and tax treaties. We have gathered data for more than 100 countries, including tax havens, for three reference years, 2009, 2013, and 2017. Our main source for these data is the International Bureau of Fiscal Documentation (IBFD). We collect the tax parameters for the three different income flows: dividend, royalties and interest. On average, we observe little variation over time in the level of the tax rates and do not find strong evidence of a tax race to the bottom.

With the tax parameters we construct the two tax rate differentials, the direct tax planning gain and the treaty shopping gain, and combine these with the bilateral flows to approximate the tax planning gain. A rough measure of the total annual gain realized on royalties through Dutch SPEs is 1.2 billion euro, for the other income flows the gains are negligible or non-existent. Given incoming and outgoing flows of more than 100 billion euro per year this tax planning gain could be interpreted as modest. The approximation must be seen as a lower bound, i.e. underestimating the full size of the tax planning gain, or tax avoidance. One reason is that the estimate does not capture the tax planning gains that can be made in other countries, i.e. when the immediate destination of the flow is a conduit jurisdiction in a longer chain of countries. We remark that we cannot determine whether the two countries of a flow are the ultimate country of origin or destination.

Finally, with an econometric analysis we estimate the determinants for guiding income flows via the Netherlands. We explain the likelihood that a route is used, the extensive margin, and the size of the flow, the intensive margin. The determinants of the extensive margin are

estimated using a probit model and for the intensive margin we use OLS and a Poisson Pseudo Maximum Likelihood (PPML) method. The main independent variable is the treaty shopping gain, i.e. the tax rate differential between the direct route (without the Netherlands) and the indirect route (using Dutch SPEs). For dividend, interest and royalty flows we find that a larger treaty shopping gain increases the probability that the flow is diverted via a Dutch SPE. If the tax differential is 10% points higher (making the indirect route more attractive), the marginal probability increases by 1.6% points for dividends, 1.6% points for interest and 3.4% points for royalties. These effects are statistically significant. A higher treaty shopping gains (TSG) also increases the size of the income flow via the Netherlands. A 10% point higher TSG on average increases the flow of dividends by 3%, the flow of interest by 31% and the flow of royalties by nearly 76%.

The paper contributes in various ways to the literature. Foremost it analyses bilateral flows of dividends, royalties and interest, derived from a dataset on Dutch SPEs. Except for an earlier paper of Weyzig (2013), mainly analyzing FDI stock data, these data have never been exploited. The access to this unique data set is one of the privileges of this paper. It permits to examine the direct impact of taxation on the existence and size of these bilateral flows, instead of measuring an indirect impact on the FDI positions. Second, this paper develops measures for the direct tax planning gain and the treaty shopping gain, exploiting tax parameters and the bilateral allocation of the different income flows. Third, we explain the variation in these income flows in a cross-sectional econometric analysis. Apart from a paper of Dudar et al. (2015) on royalty flows we are not aware of other papers explaining bilateral flows on dividend, interest or royalties. Overesch and Wamser (2014) explain bilateral internal debt financing by the tax differential between the borrowing and lending country. They find a strong effect. However, they use a stock variable debt instead of the interest flow which is taxed.

The paper proceeds as follows. Section 2 introduces the financial statement data of the Dutch SPEs from DNB. The construction of the bilateral income flows is presented here as well. Next, section 3 is a methodological section on the approximation of the tax planning gain. Section 4 presents the tax parameters and combines these with the constructed bilateral income flows to estimate the tax planning gains. Section 5 discusses the results of the econometric analysis. Section 6 concludes.

2 Dutch Special Purpose Entities

Financial data on Special Purpose Entities (SPEs) are provided by the Dutch Central Bank (DNB). SPEs are entities that are directly or indirectly controlled by foreign owners and have their assets and liabilities primarily in other countries. DNB collects data on all SPEs, but the surveys are more detailed for an unbalanced sample of SPEs. We only use data from this sample, since these include financial data by country origin and destination. We use data for the period 2004 to 2016.

SPEs form a cluster if they have the same ultimate controlling owner. Table 2.1 shows the number of SPEs and the number of clusters in each year of our sample. The number of observations refers to combinations of SPEs and countries.[3] The table reveals that the average number of SPEs per cluster increases from approximately 2 to 4 with a break between 2012 and 2013. This is due to the revision of the sampling method by DNB. The number of observations per SPE is more or less steady at about 9 observations per SPE, implicating that the SPE has financial relations with holdings in 9 countries (including the Netherlands). This average hides an enormous heterogeneity: from 2 to about 100 country-observations per SPE per year. Since the income flows can be quite erratic over time, we mainly present three-year averages for the periods 2005-2007, 2008-2010, 2011-2013 and 2014-2016. The number of unique SPEs, clusters and observations in such a period is much smaller than the sum of the three years, since there is a large overlap in SPEs and countries over the years.

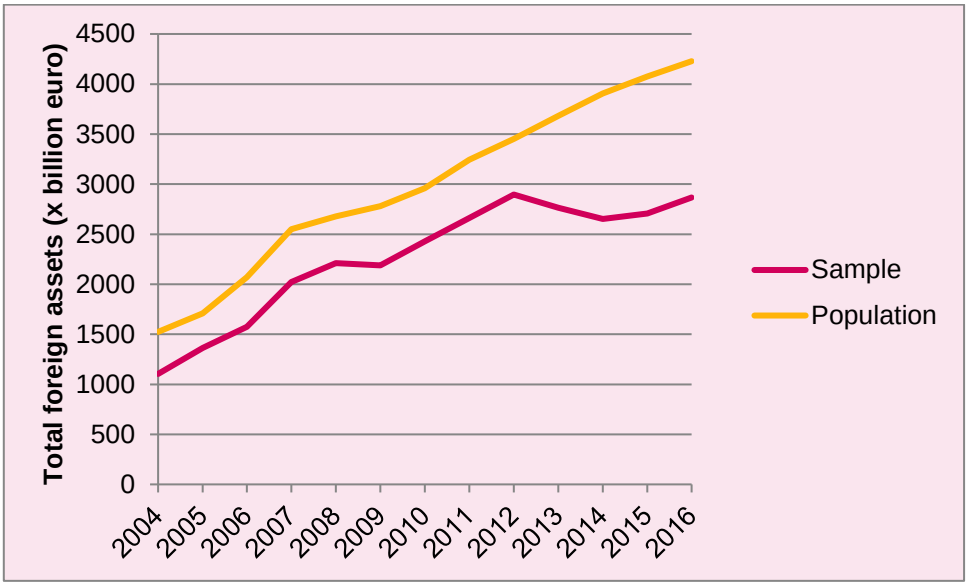
Table 2.1 Sample of Special Purpose Entities

Year	SPEs	Clusters	Observations
2004	967	420	8532
2005	978	473	9126
2006	1029	510	9414
2007	1155	593	10636
2005-2007	*1355*	*632*	*13617*
2008	1412	735	11831
2009	1384	757	12969
2010	1460	767	13204
2008-2010	*1819*	*927*	*17258*
2011	1409	739	13487
2012	1650	745	14527
2013	1344	320	11197
2011-2013	*2034*	*792*	*18114*
2014	1147	257	9772
2015	1152	234	9846
2016	1156	242	10367
2014-2016	*1503*	*319*	*13844*

[3] For example, an SPE with assets in country A, B, C and liabilities in country C and D, has four observations in our data.

Figure 2.1 shows the development over time of total foreign assets of SPEs in our sample. Assets in the Netherlands are excluded. In the rest of the paper we also exclude any assets, liabilities, or transactions with third parties in the Netherlands. Since our sample is not representative over time, it is not suitable for drawing conclusions on the development over time. As a reference, the figure also contains total foreign assets of the full population of SPEs in the Netherlands, as reported by DNB. The SPEs in our sample cover between 66% (2015) and 84% (2012) of the total foreign assets of the population. The stagnation of total foreign assets in our sample in the last years is caused by changes in the composition of the sample; the sampling method is revised in 2013.

Figure 2.1 Total foreign assets of SPEs at end of year of sample and population



2.1 Assets and liabilities, incoming and outgoing flows

We distinguish three categories of assets (affiliates; bonds and other loans; other) and three categories of liabilities (major shareholder equity; other loans; other). Appendix A shows a list of items contained in each category. We separate listed bonds from other liabilities, since we expect that tax motives are less relevant for issuing bonds than for borrowing from affiliates. On the asset side, bonds are combined with other loans, which is already the case in the source data.[4]

Table 2.2 shows the sum of the foreign assets and liabilities mentioned above over all SPEs in our sample, averaged for the periods 2005-2007, 2008-2010, 2011-2013 and 2014-2016. These data are based on assets and liabilities in countries other than the Netherlands, which explains why total assets are not equal to total liabilities. SPEs invest mainly in equity of affiliated firms (62% in 2014-2016) and in debt (34% in 2014-2016). In this period they were financed by major shareholder equity (58%) and direct debt (24%). Between the first

[4] On the assets side, listed bonds are negligible in comparison with other loans.

and the last period in our sample, affiliated equity has become more important: its share increased from 55% to 62% (assets) and from 49% to 58% (liabilities).

Table 2.2 Assets and liabilities at end of year (billion euros)

Category	2005-2007	2008-2010	2011-2013	2014-2016
Assets				
Affiliates	911	1323	1724	1702
Debt (including bonds)	692	873	963	942
Other assets	50	80	86	97
Total	1653	2276	2773	2741
Liabilities				
Equity by major shareholders	827	1256	1666	1621
Debt	479	631	660	661
Other liabilities	377	449	446	503
Total	1683	2336	2772	2785

Table 2.3 shows the total incoming and outgoing flows to and from Dutch SPEs in our sample. Again this only reflects incoming and outgoing flows from and to other countries than the Netherlands. In line with total assets and liabilities, incoming and outgoing flows increased strongly between 2005-2007 and 2014-2016. Royalty flows were relatively small in 2005-2007, but increased substantially over time and incoming and outgoing royalty flows are even larger than interest flows in 2014-2016. However, only a small number of SPEs has incoming or outgoing royalties on their balance sheets, suggesting relatively large royalty flows by SPE compared to dividend and interest flows. Note that changes over time can reflect changes in the composition of the sample. This explains, for example, the big changes in the categories other income and other costs.

Table 2.3 Incoming and outgoing flows (billion euro)

Category	2005-2007	2008-2010	2011-2013	2014-2016
Incoming				
Dividend from affiliates	57	75	92	77
Interest from other loans	23	30	27	23
Royalties	5.8	12	20	26
Other income	8	26	40	2
Total	94	143	178	128
Outgoing				
Dividend to affiliates	40	56	61	51
Interest on other loans	14	17	13	9
Royalties	4	10	15	28
Other costs	20	40	56	18
Total	79	123	145	106

In the remainder of the paper we focus on the spread of the incoming and outgoing flows. The dataset includes the country of origin and destination for assets, liabilities, incoming and outgoing flows. We show the share of incoming (Table 2.4) and outgoing flows (Table 2.5) of the total flow of the same category for the countries with the largest flows in 2014-2016. For dividends the incoming flows are less concentrated than for interest for example. Incoming

royalty flows are heavily concentrated. Most of them come from Ireland and the top 3 nearly covers 90 percent of the flows. Quite often the United States is the origin of a flow what can be explained by its economic size, but in many cases the size of the flows is hardly related to the economic size of the country of origin. Examples are Ireland, Luxembourg, Singapore, and Switzerland. The United States is also an important destination country, but we also find tax havens such as Bermuda and Cayman Islands in the top 3 and conduit countries such as Ireland, Luxembourg, Singapore, and Switzerland. Countries can be both relevant origin and destination countries.

Table 2.4 Country ranking by incoming flows in 2014-2016

Incoming dividend 2014-2016		Incoming interest 2014-2016		Incoming royalties 2014-2016	
Country	**Share**	**Country**	**Share**	**Country**	**Share**
Singapore	11%	Germany	23%	Ireland	59%
Brazil	11%	Ireland	17%	Singapore	19%
United States	10%	Spain	10%	United States	9%
Luxembourg	9%	United States	8%		
Switzerland	7%	United Kingdom	7%		

Table 2.5 Country ranking by outgoing flows

Outgoing dividend 2014-2016		Outgoing interest 2014-2016		Outgoing royalties 2008-2010	
Country	**Share**	**Country**	**Share**	**Country**	**Share**
United States	23%	United States	18%	Bermuda	64%
United Kingdom	14%	United Kingdom	13%	United States	23%
Switzerland	13%	Cayman Islands	12%		
Luxembourg	11%	Luxembourg	8%		
Germany	7%	Ireland	8%		

* Not reported due to non-disclosure rules. For outgoing royalties we show the largest flows for a different period (2008-2010).

We only observe the flows to the first country of destination and do not know what happens after.[5] However, it is most likely that the country of destination for outgoing flows is not always the final destination. An indication for this is the country of the ultimate beneficial owner (UBO). We have the country of the UBO for a subsample of SPEs, covering over 85% of outgoing dividend, interest and royalties. In Table 2.6 we compare the shares of outgoing flows with the shares of the ultimate beneficial owners. The table lists five countries that receive the largest dividend and interest flows and the three countries that receive the largest royalty flows.[6] It shows that countries like Switzerland and Luxembourg (dividend), the Cayman Islands, Luxembourg and Ireland (interest) and Bermuda (royalties) receive relatively large flows while the ultimate beneficial owner resides in a different country. These countries are relatively often not the final destination of the income received from Dutch SPEs. The opposite is the case for the United States. A large part of the outgoing dividend (41%), interest (36%) and royalties (98%) are related to ultimate beneficial

[5] This is also the case for incoming flows. We do not know whether the active business income was generated in the immediate country of origin.
[6] The ranking and shares can deviate somewhat from Table 2.5, since Table 2.6 is based on the subsample of SPEs for which the country of the ultimate beneficial owner is known.

owners in the United States, but the direct flows from Dutch SPEs to the United States are only 26% for dividend, 18% for interest and 23% for royalties.[7]

The fact that various countries of origin or destination are tax havens, or conduit countries, suggests that the cross-border flows pass various countries. This contradicts with Mintz and Weichenrieder (2012) concerning German multinationals in 2001. They examine ownership chains and find that only 1.2% of all chains passes three or more borders. In this respect, the Netherlands seem to have a different role than Germany.

Table 2.6 Outgoing flows to countries and ultimate beneficial owners

	Dividend (in %) 2014-2016			Interest (in %) 2014-2016			Royalties (in %) 2008-2010	
Country	Direct	UBO	Country	Direct	UBO	Country	Direct	UBO
United States	26	41	United States	18	36	Bermuda	65	*
Switzerland	15	5	United Kingdom	13	9	United States	23	98
United Kingdom	13	20	Cayman Islands	13	0			
Luxembourg	10	*	Luxembourg	8	1			
Germany	8	9	Ireland	8	1			

* Not reported due to non-disclosure rules. For outgoing royalties we show the largest flows for a different period (2008-2010).

2.2 Construction of bilateral flows

For the analyses in the next sections of this paper we need bilateral primary income flows between two countries. We do not observe these bilateral flows for all SPEs directly in the data, and therefore, partially, have to construct these flows.

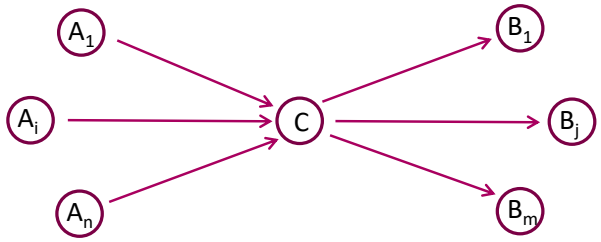
In some cases this is straightforward. Consider a SPE that is owned by a single owner in country B and invests in affiliates in countries A_1, A_2 and A_3. It receives dividends X_1, X_2 and X_3 from its affiliates and pays out the sum of these dividends as dividend to its owner in country B. In this case we define the dividend flow from A_i to B as X_i. However, the type of the incoming flow is not necessarily the same as the type of the outgoing flow. If the SPE was fully financed by debt instead of equity, it would use its incoming dividend to pay interest to its lender in country B.

In most cases the allocation is not as straightforward as in the examples above, due to three reasons. First, SPEs often receive payments from multiple countries and also make payments to multiple countries. In these cases, the SPE acts as a hub. This is illustrated by Figure 2.2, where C is the Dutch SPE, A_1, … A_n are countries where flows originate from and B_1, … B_m are

[7] The data allow us to consider more income routes between different countries with the Netherlands as intermediate than particular cases presented in the media. However the data do not allow for the analysis of multi-country income routes. Take the well-known double Irish –Dutch sandwich as many US MNEs have used. With these data we notice the income flow from the company in Ireland to the holding in Netherlands. These are often royalties because Ireland levies a withholding tax on royalties and the Netherlands not (until 2021). However, we do not see the royalty's flows from other countries to Ireland. Probably these flows will also lead to a tax savings gain, which is also not included in our estimates in Section 4. We do see the royalties from the Netherlands to the Irish holding on Bermuda (originated from the holding in Ireland). So the can quantify the last two steps to the final destination (Irish – Dutch – Irish on Bermuda), but still do not know where the incomes are generated (see link).

countries of destination for these flows. For about 95% of the total incoming and outgoing flows, the cluster of SPEs has multiple countries of origin and destination.

Figure 2.2 The SPE as a hub



Second, there can be several types of incoming and/or outgoing flows. For example, this happens when an SPE is financed by equity as well as debt and pays out dividend and interest. In these cases we need to connect the incoming flows to both types of outgoing flows.

A third complication is that total incoming flows are not always equal to total outgoing flows. This happens, for example, when incoming dividend is retained and distributed to the owners in later years. It is also possible that outgoing payments are smaller than incoming payments due to taxes in the source country.[8]

We deal with the problems of multiple countries and/or multiple types of flows by assigning the flows proportionally. The problem of unequal incoming and outgoing payments is solved with by defining the total flow as the minimum of total incoming and total outgoing payments. This proportional assignment of flows is done at the cluster level of SPEs:

$$F_{io,xy} = \frac{I_{t=i,x}}{TI}\frac{O_{t=o,y}}{TO}\min(TI, TO)$$

where $F_{io,xy}$ is the calculated flow of type i from country x to country y as type o, $I_{t=i,x}$ is the incoming flow of type i from country x, $O_{t=o,y}$ is the outgoing flow of type o to country y, TI is the total incoming flow of the cluster from all countries and in all types and TO is the total outgoing flow of the cluster to all countries and in all types. Subscripts for time and clusters are omitted. The left part of the equation gives a fraction of the total flow of the cluster that we allocate to the flow between country x and y as type i to type o. This fraction is multiplied by the minimum of the total incoming flow and the total outgoing flow.[9] We only take into account positive incoming and outgoing flows and we ignore negative flows. After calculating the bilateral primary income flows, we determine the aggregates between two countries by summing over all clusters.

[8] SPEs are assumed to report gross payments before withholding taxes. When withholding taxes are paid in the source country, the actual income by the SPE is smaller than the reported income, which also means there is less available for outgoing payments.

[9] As a robustness check we also perform this allocation using the maximum instead of the minimum of the total incoming and outgoing flow. This did not have a significant effect on the tax planning gains in section 4 and the regressions results in section 5.

Table 2.7 shows the assigned primary income flows, by type averaged over 2014-2016. This table is based on the allocation of the minimum of total incoming and outgoing income per cluster, as explained above. Appendix B contains a similar table based on an allocation using the maximum. The values in the upper left box represent the sum of the flows between every pair of countries. In addition to flows between two foreign countries, the table reports a row and column labeled 'NL/retained'. These contain a large part of total incoming and outgoing income. The first reason for this is that there are substantial flows between foreign countries and third parties in the Netherlands. Since we are only interested in flows between two foreign countries, we exclude these flows from the analysis. The second reason is that incoming and outgoing flows are not always equal for individual SPE-clusters. If incoming foreign payments are higher, some income is left within the SPE or paid as taxes. Outgoing payments can also be higher if SPEs make payments from previously retained income. These differences are allocated to and from retained income. For the full sample in 2014-2016, SPEs received annually 128.1 billion euro from and paid out 106.4 billion euros to foreign countries. The rows and columns add up to the totals reported in Table 2.3.[10]

Table 2.7 Assigned primary income flows, by type in 2014-2016 (billion euros)

To: / From:	Dividend	Interest	Royalties	Other	To NL / retained	Total
Dividend	29.1	4.1	6.3	7.0	30.4	76.9
Interest	5.4	3.1	0.9	7.3	6.4	23.1
Royalties	1.7	0.2	19.8	0.2	4.0	25.9
Other	0.7	0.1	0.2	0.9	0.4	2.3
From NL / retained	14.5	1.5	0.8	2.6		
Total	51.4	9.0	28.0	18.0	106.4	128.1

In the remainder of the paper, we focus on the flows $F_{io,xy}$ between two foreign countries ($x \neq$ NL and $y \neq$ NL), where the incoming type i is the same as the outgoing type o *(i=o)*. As the diagonal of Table 2.7 shows, these form the bulk of international flows, representing 61% in the period 2014-2016.[11] In particular, we focus on flows of dividend, interest, and royalties. These flows will be used to estimate the treaty shopping gain in section 4.2 and for the regression analysis in section 5.

[10] The totals in Table 2.3 are slightly lower, since it includes negative values, while Table 2.7 is based only on positive values. However, the difference is negligible and is not visible in the rounded values.
[11] A relatively large amount (6.6 billion euro) is transformed from incoming interest to outgoing payments on securities. In most cases, these outgoing payments on securities consist of interest paid on listed bonds. We separate these from interest on other loans, because we expect tax planning motives to be less relevant for payments on listed securities.

3 Approximating tax planning gain

In recent years a number of studies have estimated the size of international tax avoidance and evasion. Some of them include international tax planning strategies of firms and wealthy individuals.[12] Others focus mainly on the strategies of multinational firms. Gravelle (2013) estimates a loss of corporate tax revenues for the US of 0.6% of GDP. Crivelli et al. (2016) derive an estimated loss of about 1% of GDP for OECD countries and 1.3% for developing countries. They also include the effects of tax competition in their analysis. Beer et al. (2018) conclude that the tax revenue loss for the US is about 0.4%. For most developed countries the loss is much smaller and low tax jurisdictions obtain higher tax revenues. On average the tax revenue loss is only 0.1% of GDP.

Concerning Dutch SPEs there are studies by Weyzig (2015) and of Kerste et al. (2013). They confirm the sizable diversion of FDI through the Netherlands, but they do not contain estimates on the size of tax avoidance. In this study we aim to estimate the size of tax avoidance through treaty shopping. However, instead of focussing on the tax revenues of the countries we focus on the tax planning gains of the firms. As we do not have actual tax revenues of SPEs at our disposal, we combine the observed income flows of the SPEs and a set of collected tax parameters.

Tax planning gains do not always point to aggressive tax planning or evasion. Blouin (2014) concludes that there is no clear consensus at what point tax planning becomes aggressive. Quite often the savings from tax planning are not only legal, but these are also nonaggressive. Below we present our methodology.

3.1 Direct tax planning gain

A distinction can be made between avoiding or reducing double taxation and avoiding or reducing corporate taxation *per se*. This distinction broadly corresponds to the different mechanisms of international taxation of dividends on the one hand and taxation of interest and royalty payments on the other hand.

Figure 3.1 Direct international income flow

Let active corporate income be generated by an entity in source country A. This country has a nominal corporate income tax (CIT) rate of t_A. This entity may have borrowed from an entity in country B, or used intellectual property (IP) rights owned in B, which features a CIT rate of t_B. In some period this will lead to an income flow x, interest or royalties, from country A to B, as illustrated in Figure 3.1. In most cases the interest or royalty payments

[12] Examples are Zucman (2013), Altstaeter et al. (2015), Torslov et al. (2018) and Henry (2012).

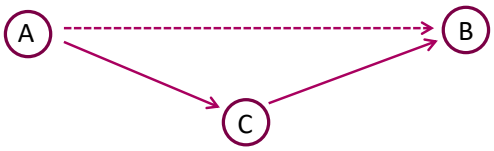
made will be deductible from the taxable corporate income in country A. This implies a tax saving of $t_A x$. Source country A may levy a non-resident withholding tax w_{AB} on the income flow to country B. This gives a net flow of $(1-w_{AB})x$. Next, these flows are passive corporate income in country B, which will be subject to taxation in most cases: $t_B(1-w_{AB})x$. The net tax savings are as follows: $t_A x - w_{AB}x - t_B(1-w_{AB})x$, or $(t_A - t_B - (1-t_B)w_{AB})x$. Residence country B may decide to credit withholding tax $w_{AB}x$ against the taxes due in B, i.e. $t_B x$ as a form of double tax relief, discussed in more detail below. So, assuming that the CIT rate in the residence country is higher than the withholding tax of the source country the tax savings are $(t_A - t_B)x$.

When the net tax savings are positive we denote this as a *direct tax planning gain*. Without the withholding tax, there will be taxes saved, obviously, when the CIT rate in source country A exceeds the one in country B. Thus, the reference situation is where the loan is from, or the IP is located in, the very same country. We believe our definition is neutral and we refrain from using the term 'avoidance' in the definition as it may have negative connotations. Tax savings are equated with the tax planning gain.

3.2 Treaty shopping gain

Now consider the situation where the entity in A decides to distribute profits to owners located in residence country B. The dividend x is after corporate taxation in A, of size $t_A x / (1-t_A)$. Again, source country A may levy a non-resident withholding tax w_{AB}. The subsequent dividend flow may be subject to taxation in residence country B too. This is double taxation.

Figure 3.2 Indirect income



In the case of direct dividend repatriation there seems to be no further scope for tax reduction. This all changes when a conduit entity in a third country C is used. The Dutch SPEs are the subject of this paper and the Netherlands exempts incoming dividends. Taxation on the indirect repatriation route equals, ignoring the CIT in A, and given dividend withholding taxes w_{AC} and w_{CB}: $w_{AC} + (1-w_{AC})w_{CB} + (1-w_{AC})(1-w_{CB})t_B$.

This taxation can be compared with that on the direct route, again without the CIT in A, $w_{AB} + (1-w_{AB})t_B$. We interpret the difference between the tax costs on the direct route and on the indirect one, when positive, as a *treaty shopping gain*. Treaty shopping is the practice

where MNEs, rather than investing directly in a host country, funnel the investment through a third country to take advantage of treaty provisions not found between the host and the home country of the investment (Davies, 2004).

There is only a gain if tax rate of the two withholding taxes w_{AC} and w_{CB} combined is lower than w_{AB}. Such tax rates are often agreed upon in bilateral double tax treaties (DTT) to avoid double taxation of corporate income and to stimulate mutual FDI.

International organizations warn against treaty shopping; it is one of the Action points of the G20/OECD BEPS-initiative (OECD, 2015) and IMF (2014) identifies it as a concern for developing countries because of the loss of their tax revenue. By definition, treaty shopping involves the indirect routing, or diversion, of investment.

Double tax relief

However, apart from DTTs, countries do also unilaterally apply various relief systems to avoid or reduce double taxation. The residence country may apply a dividend participation *exemption*, where incoming dividends are not taxed at all. Most often this is granted only when certain conditions are met, such as a threshold of 25% ownership of the foreign affiliate. Alternatively, the country may apply a *credit* system, where taxes paid in the source country are credited against the corporate taxes due in the residence country. Excess credit does not result in payment from the tax authority. Finally, there is *deduction*, which is when no relief is granted other than that there are no taxes due on taxes already paid.[13]

The treaty shopping gain is determined by the country-specific CIT rate, the bilateral withholding taxes, and by the tax relief systems of the Netherlands and of the destination country. There are six different cases depending on the relief system of destination country B and the type of income flow. We first consider the taxes paid in each of the cases for direct flows from A to B in Table 3.1.

Table 3.1 Taxation on the direct route A to B

	Interest, royalties	Dividend
Exemption	w_{AB}	$t_A + (1-t_A)w_{AB}$
Credit	$\max(w_{AB}, t_B)$	$\max(t_A + (1-t_A)w_{AB}, t_B)$
Deduction	$w_{AB} + (1-w_{AB})t_B$	$t_A + (1-t_A)w_{AB} + (1-t_A)(1-w_{AB})t_B$

Next we consider the tax burden on the indirect route. There will be no corporate income taxation in the conduit country C. Interest and royalties are in principle taxable foreign income, but we assume that it will immediately be deducted as it flows through to a next destination country B.[14] There is no corporate income taxation for dividends, since the conduit country is the Netherlands, which applies the dividend participation exemption. The withholding tax rate w_{CB} for interest and royalties is zero in the Netherlands. Observe that

[13] For a discussion of double tax relief and the effective tax rates on dividend repatriation see also Barrios et al. (2012).
[14] In practice, an Advance Tax Ruling by the Dutch tax authority may result in some taxable income.

for interest and royalties the tax is identical in the credit and deduction cases since $w_{CB} = 0$ and only taxation in the preceding country can be credited, as shown in Table 3.2. For a similar treatment of taxes on repatriated dividends, see Barrios et al. (2012).

Table 3.2 Taxation on the indirect route from A via C to B

	Interest, royalties	Dividend
Exemption	w_{AC}	$t_A + (1-t_A)w_{AC} + (1-t_A)(1-w_{AC})w_{CB}$
Credit	$w_{AC} + (1-w_{AC})t_B$	$t_A + (1-t_A)w_{AC} + \max[1-t_A)(1-w_{AC})w_{CB}, t_B]$
Deduction	$w_{AC} + (1-w_{AC})t_B$	$t_A + (1-t_A)w_{AC} + (1-t_A)(1-w_{AC})w_{CB} + (1-t_A)(1-w_{AC})(1-w_{CB})t_B$

Treaty shopping gain (TSG) is the difference between the taxation on the direct route and the indirect route, as specified in Table 3.1 and Table 3.2. The CIT in source country A drops out in the difference. For dividend this equals the total tax planning gain. In the case of interest and royalties this is different, as these deductible costs lead to a tax saving in country A at rate t_A.[15] The total tax planning gain (TPG) equals the sum of the direct tax gain (DTG) and the treaty shopping gain (TPG = DTG + TSG). For an overview of the tax variables see table 3.3. The bilateral direct tax gain (DTG) and the bilateral treaty shopping gain (TSG) will be explanatory variables in the regression analyses.

Table 3.3 List of tax variables

Tax variable	Description	Equation	Regression
CIT_A , CIT_B	Corporate income tax in host A, home B		
TAX_{AB}	Tax on the direct route A to B		
TAX_{ACB}	Tax on the indirect route A to B over C = NLD		
DTG	Direct TAX planning Gain	**= CIT_A - TAX_{AB}**	yes
TSG	Treaty ShoppingGain	**= TAX_{AB} - TAX_{ACB}**	yes
TPB	Total tax planning Gain	**= DTG + TSG**	

CFC – rules

Some countries have implemented specific legislation to protect their tax bases, apart from general anti-abuse rules. By enacting so-called CFC (Controlled Foreign Company) rules the home country would deem foreign profits in LTJs as repatriated dividends and subsequently tax them. Even countries that usually exempt foreign dividends will, under specific control conditions of the CFC-rules, tax these profits. Voget (2011) demonstrates empirically that the introduction of CFC legislation has led to relocation of headquarters. Clifford (2018) does so for subsidiaries. Circumventing CFC-rules may also be possible by inserting an additional holding company in a jurisdiction which is not covered by the control conditions, possibly combined with a hybrid mismatch. CFC legislation may take many forms. We have implemented it as follows: for all countries with CFC-legislation, we set the tax relief method to 'deduction' for all jurisdictions on the Gravelle (2013) tax haven list.[16]

[15] We will assume full deductibility, thus ignoring thin capitalization rules.
[16] Obviously this is a crude proxy, but given the scope of our paper a reasonable assumption

Given the set of stylized definitions made above, an estimate of the tax planning gain can be computed. In principle this could be done at the level of individual SPEs as well as at the aggregate level.

Underestimation of tax planning gain

Above we have presented an operational definition of tax planning gain. There are three reasons why one will end up with a lower bound of this gain and why the actual gain may be higher. First, we use nominal CIT rates and do not include special circumstances, or regimes that may lower effective tax rates. Details of tax legislation that we have not been able to include are likely to imply lower taxes and, hence, higher gains. Second, and at least as important, there may be next jurisdictions involved, after B – the immediate destinations, with even lower tax rates, so that the tax gain based on the tax rate of jurisdiction B is an underestimation. Third, we take the primary income flows as given. The sizes of these flows are also part of the decisions of the MNEs and we cannot assess whether these represent 'correct' values. For instance, the Arm's length – principle may be hard to apply for royalties as often IP and its use are unique. Hence, we cannot address the *transfer pricing* channel of tax avoidance in this study. We make an estimate of the size of tax planning gain given the payments.

4 Tax parameters and tax planning results

4.1 Tax parameters

For lack of microdata on actual taxes paid we resort to the available tax rates at national level and those agreed in DTTs.

In an extensive data collection effort, tax rates were obtained from the International Bureau of Fiscal Documentation (IBFD). This was done for three references years: 2008/2009, 2013 and 2017/18. The most recent country information applies in most cases to the year 2017 and/or 2018.[17] The electronically available data from this source does not go further back than 2008. Data was collected for the set of 108 jurisdictions used in the network analysis of van 't Riet & Lejour (2018). These countries cover about 95% of world GDP and a substantial number of countries are classified as tax havens.

We obtain six tax parameters by country and reference year. First, the headline CIT rate is either given by the IBFD, or decided by us. Next, for dividend, interest and royalties there are the default (standard) rates of the non-resident withholding tax.[18] These rates may vary by sector, where we have selected the most general one. Finally, there are the unilateral double tax relief methods, which often differ for dividend and for interest and royalties. This gives two tax parameters by country and year indicating 'deduction', 'credit', or 'exemption' as discussed in section 3.[19]

The bulk of the tax rates are bilateral; DTTs often agree on mutual lower tax rates than the default withholding tax rates for the three types of income flows. Reduced rates sometimes are conditional, again by sector or ownership. Without further information, and to keep computations manageable, we have applied the following heuristic to select one tax rate per country pair and income type. For dividends we take the lowest rate, because here the conditions often involve thresholds in ownership. We assume that companies meet these conditions and qualify for the lowest rate. For dividends, there are different rates for qualifying companies as opposed to individuals and companies in general. We have taken the former and apply these to the relevant flows. For interest we take the one but lowest rate, because the lowest rate often applies to special sectors.

At the bilateral level the double tax relief methods could vary. For instance, Canada grants a participation exemption for dividend coming from treaty partners. Such detail we have not included. We have included the Parent-Subsidiary Directive and the Interest and Royalty Directive of the European Union (EU, 1990 and 2003). They imply zero withholding tax rates and dividend exemption on flows between EU member states in participation situations.

As an introduction to these tax rates we present the world averages for the three reference years. The first three columns of Table 4.1 present the GDP-weighted world averages for the

[17] The IBFD Tax Research Platform was accessed online between end of January and March 2018.
[18] Note we use the dividend rate on substantial shares in ownership and not on portfolio dividend.
[19] The possibility of no-relief-at-all also exists. This has been treated as deduction. Some countries exempt only up to 95% of foreign source dividend. This has been treated as full exemption.

CIT rate and the three default withholding tax rates. We observe a very modest decline, and for interest not even monotonous. A tax race to the bottom cannot be observed in these world averages of nominal rates for this time period. We also observe that on average the variation between 2013 and 2017 is modest; the tax parameters of 2013 will be combined with the average flows over 2014-2016. The fourth column presents unweighted averages for 2013. These rates are much lower given the high weight of the US and its high tax rates; US in 2013, CIT is 39%, all three default withholding tax rates are 30%.

Table 4.1 World average CIT and default withholding rates (in %)

	2009	2013	2017	2013
		Weighted		Unweighted
Corporate income tax	31.46	29.85	29.66	22.59
Default withholding tax on dividend	20.60	19.72	19.64	12.75
Default withholding tax on interest	19.57	17.84	18.39	12.49
Default withholding tax on royalties	21.37	21.02	20.34	14.51

In Table 4.2 world average withholding tax rates are considered based on the bilateral rates, included in the tax treaties. The first three columns present weighted averages, in this case double GDP-weighted. The level is obviously much lower than the defaults because of the mutually agreed reductions. No steady pattern is observed, an average increase from 2009 to 2013, then a decline to 2017. The variation between 2013 and 2017 is again modest. The fourth column gives the unweighted averages for 2013. The level here is higher than that of the weighted averages, which implies that larger countries have larger reductions in the treaties compared to the default rates (confirmed by US bilateral rates).

Table 4.2 World average bilateral withholding rates (in %)

	2009	2013	2017	2013
		Weighted		Unweighted
Bilateral withholding tax on dividend	7.23	7.99	7.69	10.69
Bilateral withholding tax on interest	8.68	9.12	8.92	11.59
Bilateral withholding tax on royalties	8.23	9.28	9.00	13.09

4.2 Results on tax planning gain

This section gives estimates on the direct tax planning gain and on the treaty shopping gain of the SPEs in our sample. We calculate the tax rates for the direct route and the indirect route for of each country pair, using the method described in section 3. These are then weighted by the bilateral flows, which are constructed by us in section 2.2. These weighted averages of the tax rates are reported in Table 4.3. For the direct tax planning gain we compare the weighted average tax rate on the direct route with the counterfactual where income would be taxed in the country of origin against the local CIT rate. For the treaty shopping gain we compare the weighted average tax rate for transferring income via an SPE in the Netherlands, with the counterfactual where the income would go directly from the country of origin to the country of destination. We only report the direct tax planning gain for interest and royalties, since for dividends the direct route is always more expensive than the CIT rate in the country of origin.

Table 4.3 Weighted averages total (CIT and withholding) tax rates (in %)

Weighted by	2008-2010, rates of 2009	2012-2014, rates of 2013	2014-2016, rates of 2013
Flow of dividend (directly)	31.1	32.4	31.0
Flow of dividend (via the Netherlands)	33.3	32.6	35.9
Treaty shopping gain (TSG)	*–2.2*	*–0.2*	*–4.9*
CIT in host country	27.6	24.6	23.9
Flow of interest (directly)	29.8	26.3	26.1
Flow of interest (via the Netherlands)	28.6	24.8	24.3
Direct tax planning gain (DTG)	*–2.2*	*–1.7*	*–2.2*
Treaty shopping gain (TSG)	*1.2*	*1.5*	*1.7*
Total tax planning gain (TPG)	*–1.0*	*–0.2*	*–0.5*
CIT in host country	15.4	15.0	15.1
Flow of royalties (directly)	22.0	23.6	22.3
Flow of royalties (via the Netherlands)	4.8	7.6	8.9
Direct tax planning gain (DTG)	*–6.6*	*–8.6*	*–7.2*
Treaty shopping gain (TSG)	*17.2*	*16.0*	*13.4*
Total tax planning gain (TPG)	*10.6*	*7.4*	*6.2*

For dividend the treaty shopping gain is negative, which means that the total tax expenses increase when the Netherlands is included in the route. For interest and royalties, the treaty shopping gain is positive. This is especially the case for royalties, where the difference is 13.4% points in 2014-2016. This is due to the lack of a withholding tax on royalties in the Netherlands and the low rates negotiated in tax treaties. For interest in 2014-2016 there is a treaty shopping gain of 1.7% points. Multiplied with the 3.1 billion euro from Table 2.7, this gives a treaty shopping gain of about 50 million euro. However, the total tax planning gain is negative (–0.5% points), because the total tax rate on the indirect route (24.3%) is higher than the local CIT rate in the host country (23.9%). As shown in Table 2.7, the SPEs in our sample transfer about 19.8 billion euro of royalties between two foreign countries, on average in 2014-2016. Since the average difference between the tax rate of direct and the indirect route was 13.4%, this implies a treaty shopping gain of about 2.65 billion euro. Compared to the situation where the flow stays in the host country and is taxed on average

at 15.1%, the total tax gain, composed of a direct planning loss and a treaty shopping gain, is 6.2%. With a flow of 19.8 billion euro this implies a total tax gain on royalties of 1.2 billion euro. For dividends and interest we find total tax planning losses, with our method based on statutory tax rates.

Our, admittedly rough, estimate of the total annual tax planning gain in 2014-2016, realized through the sample of Dutch SPEs, is therefore about 1.2 billion euro annually. Given a primary income flow of about hundred billion euro in that year, combined with an average CIT rate of about 30% and average withholding tax rates of around 20%, we conclude that we cannot derive massive tax planning gain using the Netherlands with our approximation. This does not imply that there are no substantial tax planning gains. For various reasons, discussed in section 3, these estimates are serious underestimations.

With respect to interest, and possibly also for royalties, we expected larger differences between the CIT rates of the countries of origin and destination. These countries also include the US with a high CIT rate. It has been suggested that interest and royalties destined to the US may end up in states with preferential regimes, such as Delaware, and thus avoiding the high federal US rate. This would imply far higher tax planning gains for flows to the US.[20] However, we have no information on the particular states of destination in the US. As a sensitivity analysis we have excluded all country pairs where the US is the country of origin or destination. Since the US has a relatively high CIT rate, excluding the US leads to lower weighted average rates, see Table 4.4. The total tax planning gain changes sign from negative to positive for interest and becomes larger for royalties. These gains can still be interpreted as a conservative estimate because we have also exluded the US as country of origin.

Table 4.4 Weighted averages total (CIT and withholding) tax rates (in %)

Weighted by	2008-2010, rates of 2009	2012-2014, rates of 2013	2014-2016, rates of 2013
Flow of dividend (directly)	29.9	30.6	27.2
Flow of dividend (via the Netherlands)	30.3	27.6	27.3
Treaty shopping gain (TSG)	*–0.4*	*3.0*	*–0.1*
CIT in host country	26.3	23.6	23.2
Flow of interest (directly)	26.1	23.4	23.2
Flow of interest (via the Netherlands)	24.0	21.2	20.7
Direct tax planning gain (DTG)	*0.2*	*0.2*	*0.0*
Treaty shopping gain (TSG)	*2.1*	*2.2*	*2.5*
Total tax planning gain (TPG)	*2.3*	*2.4*	*2.5*
CIT in host country	15.2	14.8	14.5
Flow of royalties (directly)	20.3	21.4	18.7
Flow of royalties (via the Netherlands)	1.3	3.1	2.0
Direct tax planning gain (DTG)	*–5.1*	*–6.6*	*–4.2*
Treaty shopping gain (TSG)	*19.0*	*18.3*	*16.7*
Total tax planning gain (TPG)	*13.9*	*11.7*	*12.5*

[20] In addition, there exists a well-known Dutch – American hybrid mismatch, the 'CV/BV - structuur', which amounts to no corporate taxation in the Netherlands, and no taxation in the US. See Vleggeert (2015), Leiden University Tax Blog (link). We do not have information for which flows to the US, in our data, this mismatch may apply.

5 The impact of tax differentials on primary income flows via Dutch SPEs

There is hardly any research on the impact of taxation on bilateral primary income flows, like dividend, interest, and royalty income. The lack of data is a major reason of this, but still it is remarkable that the impact of bilateral taxation on these income flows is only indirectly examined by using bilateral investment flows or stocks.[21] The availability of data on Dutch SPEs enables us to examine the tax motives of these income flows through Dutch SPEs.

Our main variable of interest is the treaty shopping gain: the tax rate differential between the direct route from the host to the home country and the indirect route via the Netherlands. We calculate the tax burden that has to be paid on both routes, comprising of the relevant withholding taxes and corporate taxes, including double tax relief methods and CFC rules, as discussed in sections 3 and 4.2. This treaty shopping gain is also used by van 't Riet and Lejour (2018) in estimating the impact of treaty shopping on bilateral FDI stocks. We differ from Overesch and Wamser (2012) who construct a bilateral tax rate differential between the host and home country to examine whether this differential affects the size of interest flows and internal debt lending. Their tax rate differential is similar to our direct tax planning gain which is also included in the regressions.

We explain the extensive and intensive margin of bilateral income flows in a gravity framework. The determinants of the likelihood that a route is used (extensive margin) are estimated using a probit model. For the determinants of the size of the flows (intensive margin), we use an OLS and a Poisson Pseudo Maximum Likelihood (PPML) estimator. The flows consist of dividend, interest or royalties between countries *i* and *j*, via the Netherlands. Country *i* is the host country of the foreign investment from which the primary income flow is repatriated. Country *j* is the residence of the multinational firm, receiving the primary income flow via the Netherlands. Although we have bilateral data by SPE cluster we do not use this dimension because we have hardly explanatory variables at the cluster level. Therefore we aggregate these flow data at the country-pair level.

All variables in the regressions are three year averages between 2014 and 2016. We estimate thus a cross section. The data availability between the years 2004 and 2016 suggests the application of panel regressions. This is, however, not possible. The size of the bilateral primary income flows varies widely over the years, while the time variation of the tax parameters is very limited, see also section 4.1. Therefore, we only exploit the variation of the flows between country pairs using a cross section of the most recent years. This also explains that we do not use country and year dummies.

$$Flow_{ij} = \alpha_0 + \alpha_1 G_i + \alpha_2 G_j + \alpha_3 G_{ij} + \beta_1 TH_i + \beta_2 TH_j + \beta_3 DTG_{ij} + \beta_4 TSG_{ij} + \varepsilon_{ij} \quad (1)$$

[21] Examples are Blonigen and Davis, 2004, Egger et al, 2009, Sauvant and Sachs, 2009 and, Blonigen et al. 2014.

The vectors G_i and G_j refer to GDP in logarithms. The GDP data are from the World Bank Development Indicators, added with GDP data on tax havens from the CIA fact book. The vector G_{ij} contains bilateral data from CEPII: distance, and dummies for a common language and for a former colonial relationship. Except for distance, we expect positive coefficients for these dummies. The subscripts refer to the home country, host country, a country pair. Note that we focus on the tax variables in this section and postpone the discussion of the estimated coefficients for the gravity variables to Appendix D.

We add dummy variables for tax havens (TH), for which we expect a positive coefficient. These dummies are based on the Gravelle (2013) list. The variable DTG_{ij} is the direct tax planning gain. TSG_{ij} indicates the treaty shopping gain that can be achieved by using Dutch SPEs. Both variables have been discussed in section 4. The tax data come also from the sources mentioned in section 4. We only have tax parameters available for the years 2009, 2013 and 2017. For the three year average between 2014 and 2016 we use the tax data from the year 2013.

Table 5.1 Summary statistics for the variables in the regressions averaged 2014-2016

Variable	Obs.	Mean	Standard deviation	Min	Max
Tax haven (dummy)	106	0.255	0.436	0	1.000
Dividend					
Ln(dividend in 1000 euro)	11130	0.514	2.027	0	14.12
Pr(dividend>1000 euro)	11130	0.072	0.258	0	1.000
Direct tax rate	11130	0.354	0.138	0	0.725
Indirect tax rate	11130	0.413	0.161	0	0.904
Treaty shopping gain	11130	-0.059	0.114	-0.500	0.276
Interest					
Ln(interest in 1000 euro)	11130	0.639	1.696	0	12.59
Pr(interest>1000 euro)	11130	0.190	0.392	0	1.000
Direct tax rate	11130	0.259	0.101	0	0.649
Indirect tax rate	11130	0.276	0.112	0	0.649
Direct tax gain	11130	-0.033	0.131	-0.460	0.460
Treaty shopping gain	11130	-0.017	0.071	-0.284	0.350
Royalties					
Ln(royalties in 1000 euro)	11130	0.543	1.669	0	16.24
Pr(Royalty>1000 euro)	11130	0.150	0.357	0	1.000
Direct tax rate	11130	0.264	0.099	0	0.644
Indirect tax rate	11130	0.278	0.113	0	0.640
Direct tax gain	11130	-0.038	0.128	-0.460	0.460
Treaty shopping gain	11130	-0.014	0.076	-0.264	0.333

Notes: for the bilateral flows on dividend, interest and royalty, we apply a threshold of 1000 euro as also DNB is doing. For values below this threshold we replace the natural logarithms by 0. Summary statistics of the gravity variables are presented in appendix D.

Table 5.1 shows the summary statistics of the regression variables. The full set of data is available for 106 countries, which gives 106*105 = 11130 country pairs. The average differential between the repatriation tax rates on the direct and indirect route is negative for all three income flows, while in section 4.2 (Table 4.6), we find a positive treaty shopping gain for interest in the same period. In the latter case the differential is weighted by the size

of the actual interest flow, while the summary statistics in Table.5.1 are unweighted sample means.

Equation (1) is estimated for the extensive margin and the intensive margin. For the extensive margin we use a probit regression in which the dependent variable indicates whether Dutch SPEs are used in between two countries. For selecting which routes are used we apply a 1000 euro threshold as also DNB applies. The value of the probit dummy is 1 if the allocated bilateral flow is at least 1000 euro and is 0 otherwise. The results of these probit regressions are presented in columns (1) and (2) in Tables 5.2 to 5.4. Column (1) presents the coefficients and column (2) the marginal effects.

For many country pairs multinationals have not established a Dutch SPE for an indirect route.[22] In these cases the size of the flow is zero, which is a well-known problem in estimating the intensive margin with gravity equations, because the natural logarithm of zero is undefined. In column (3) of Tables 5.2 to 5.4 we present the results for the OLS estimation of the intensive margin, using only flows that exceed 1000 euro. A different, and standard, solution is to estimate a transformation of log (1+x), in which x is the value of the bilateral flow, which is applied for the OLS regressions in column (5) of Tables 5.2 to 5.4. This does not solve all problems. Because income values cannot be negative, the error distribution is truncated and could depend on the explanatory variables. Santos da Silva and Teynero (2006) use a Poisson Pseudo Maximum Likelihood (PPML) method for that reason. For robustness we present the results of the PPML estimator in column (4) of Tables 5.2 to 5.4. A potential problem with PPML in our application is the extreme skewed distribution of some primary income flows in various years ranging from many zero values to values of more than 100 mln USD. This skewedness can be better captured with the transformed logarithm of the dependent variable in the OLS regressions presented in column (5). Table 5.2 explains the extensive and intensive margin of dividend flows via the Netherlands. Table 5.3 does the same for interest flows, and Table 5.4 for royalty flows.

If one of the countries is a tax haven, the dividend flow is larger. This is in particular the case if the home country is a tax haven: the probability of a dividend flow is 11.6% points higher than without tax haven. The coefficient of about 2.8 in column (3) suggests that the bilateral dividend flow is about 1550% times higher if the home country is a tax haven.[23] If the host country is a tax haven, the effect is much smaller, but still sizable.

A higher treaty shopping gain has a positive impact on the probability and the size of the indirect dividend flow via the Netherlands, as is expected. The impact of a 10% point higher tax differential on the probability of a Dutch SPE is 1.6% points, which is substantial given the average probability of 7.2% (Table 5.1). The effect on the size of dividends in column (3) is positive, but insignificant. The coefficient of 0.25 in column (3) suggests that the bilateral

[22] It is possible that there are SPEs which would have a bilateral flow for a country pair but which do not have the incoming and outgoing flows in the same period; we ignore them in the analysis and put the dummy variable, for the country pair, at zero.

[23] For all numbers in the text based on column (3) we take the exponent of the coefficient and subtract 1. Due to the large coefficients in many cases, the outcomes differ substantially from interpreting the coefficients as semi-elasticities. That interpretation is only valid for small coefficients.

dividend flow via the Netherlands is hardly 3% higher if the difference between the direct and indirect tax rate is 10% points higher.

Table 5.2 Explaining bilateral dividend flows using tax variables for 2014 to 2016

Bilateral dividend flows	(1)	(2)	(3)	(4)	(5)
Estimation method	Probit	probit	ols>0	ppml	ols
Tax haven host country	0.252***	0.0252***	1.208***	1.409***	0.260***
	(0.0627)	(0.00626)	(0.313)	(0.330)	(0.0486)
Tax haven home country	1.160***	0.116***	2.803***	2.242***	0.962***
	(0.0616)	(0.00607)	(0.331)	(0.320)	(0.0567)
Treaty shopping gain (bilateral)	1.574***	0.158***	0.248	2.141**	1.021***
	(0.184)	(0.0185)	(0.909)	(0.891)	(0.164)
Constant	-16.12***		-22.73***	-32.53***	-10.83***
	(0.576)		(2.858)	(3.576)	(0.547)
Observations	11,130	11,130	796	11,130	11,130
R-squared	0.287		0.172	0.087	0.143

Notes: Robust standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Columns (1) and (2) present the results of the probit regressions with the estimated coefficients and marginal effects, respectively. The dependent variable is 1 if there is a Dutch SPE and 0 otherwise. Column (3) presents the results for the OLS regression with positive income flows as dependent (intensive margin). Columns (4) and (5) present the results for the PPML and OLS regression on zero and positive income flows. The estimated coefficients of the gravity variables are presented in appendix D.

We did not find substantial tax savings for dividends with our method using statutory tax rates in Section 4. The weighted average total tax expense is actually higher for the indirect route via the Netherlands than for the direct route. When we control for other (bilateral) country characteristics in a regression analysis, we do find that tax parameters are relevant for explaining the dividend flows via Dutch SPEs. A higher bilateral tax rate differential increases both the probability that the Dutch SPE is used and the size of the dividend flow.

Table 5.3 presents the results of the same set of regressions for bilateral interest flows via the Netherlands. As with dividend flows, a tax haven as home country has a larger impact on the probability of a Dutch SPE and on the size of the primary income flow than a tax haven as host country. The direct tax gain has an insignificant coefficient. This is not obvious; a higher CIT rate in the host country could stimulate larger outgoing interest flows to lower profits taxation in the home country, but also the negative effect on investment could dominate.

We expect that a higher tax treaty shopping gain has a positive impact on interest flows via the Netherlands. This is indeed the case for the probability of a flow. The coefficient suggests that a 10% point higher tax differential increases the probability of a Dutch SPE by 1.6%. It increases the size of the interest flow by 31% according to the coefficient in column (3). The results in this table show that a larger tax rate differential between the direct and indirect route stimulates the establishments of SPEs in the Netherlands for interest flows and also affects positively the size of these flows.

Table 5.3 Explaining bilateral interest flows using tax variables for 2014 to 2016

Bilateral Interest flow	(1)	(2)	(3)	(4)	(5)
Estimation method	Probit	probit	ols>0	ppml	ols
Tax haven host country	0.675***	0.134***	1.274***	1.408***	0.629***
	(0.0460)	(0.00890)	(0.144)	(0.429)	(0.0403)
Tax haven home country	1.160***	0.231***	1.763***	1.757***	1.005***
	(0.0460)	(0.00840)	(0.139)	(0.262)	(0.0434)
Direct tax gain (bilateral)	-0.0138	-0.00275	-0.181	0.559	0.0434
	(0.137)	(0.0273)	(0.499)	(1.668)	(0.110)
Treaty shopping gain (bilateral)	0.813***	0.162***	2.707***	7.146***	0.799***
	(0.237)	(0.0470)	(0.786)	(1.613)	(0.233)
Constant	-18.03***		-13.83***	-27.16***	-12.74***
	(0.437)		(1.297)	(4.239)	(0.401)
Observations	11,130	11,130	2,109	11,130	11,130
R-squared			0.176	0.030	0.216
	11,130	11,130	2,109	11,130	11,130
	0.269		0.177	0.031	0.218

Notes: see notes Table 5.2.

We present the regression results for bilateral royalties via the Netherlands in Table 5.4. The empirical literature on bilateral royalty flows is scarce. Besides a recent paper of Dudar et al. (2015) on the impact of taxation on bilateral royalty flows, we are not aware of other papers.

The coefficient of being a tax haven in the host and home country is statistically significant. The direct tax gain has a positive impact on the possible existence of the indirect royalty flow, but we do not find a robust effect on the size. A higher treaty shopping gain has a positive impact on the probability of an indirect flow. A 10%-point higher treaty shopping gain raises the probability by 3.4% points. The results of column (3) suggests that a 10%-point higher treaty shopping gain increases the size of the indirect flow by 76%, much more than for dividend and interest flows. For a 1%-point this corresponds to an increase of the size of the indirect flow by 5.8%. With respect to the magnitude this is comparable to Dudar et al. (2015). Using a PPML-estimator they find that a 1% point higher tax rate differential between the host and home country lowers the direct royalty flow with about 6%, which is consistent with the effect we find for the intensive margin. However, using a PPML estimator we find a much larger effect of 27%.

The coefficients are larger than for interest and dividend flows. Given the intangible nature of royalties this ordering seems not to be surprising. There is hardly empirical literature for comparing the regression results.

Table 5.4 Explaining bilateral royalty flows using tax variables for 2014 to 2016

Bilateral royalty flows	(1)	(2)	(3)	(4)	(5)
Estimation method	Probit	Probit	ols>0	ppml	ols
Tax haven host country	0.316***	0.0481***	1.719***	6.546***	0.435***
	(0.0544)	(0.00824)	(0.240)	(1.416)	(0.0396)
Tax haven home country	0.986***	0.150***	1.463***	2.761***	0.685***
	(0.0530)	(0.00763)	(0.182)	(0.696)	(0.0382)
Direct tax gain (bilateral)	1.902***	0.290***	-0.204	0.407	0.858***
	(0.174)	(0.0261)	(0.755)	(3.419)	(0.108)
Treaty shopping gain (bilateral)	2.211***	0.337***	5.655***	26.93***	1.110***
	(0.258)	(0.0390)	(1.214)	(6.169)	(0.232)
Constant	-22.62***		-17.04***	-52.67***	-13.08***
	(0.545)		(2.026)	(10.99)	(0.440)
Observations	11,130	11,130	1,669	11,130	11,130
R-squared	0.352		0.118	0.186	0.186

Notes: see notes Table 5.2.

6 Conclusions

There are a number of countries in the world which either invest or receive much more direct foreign investment than could be expected based on their economic size. In many cases these countries are tax havens in which assets and other wealth can be parked and sometimes hidden, at nearly no tax costs. In other cases these countries are conduits, such as Luxembourg and the Netherlands. Except for a number of publications on tax leaks, there is hardly any systematic information available at the firm level of these income flows.

An exception is the financial data of the most important Dutch SPEs, which we exploit in this paper. These data are available at the country level between 2004 and 2016. This paper describes the size of the flows and the geographical pattern. Moreover, it establishes the relationship between tax parameters and the size of income flows via the Netherlands. These SPEs are responsible for about 10% to 12% of the global FDI stock. The macro data show a large increase in FDI and loans in these years, from 1500 to 4200 billion euro. The most important flows are dividends. The size of outgoing dividends is 51 billion euro and incoming 77 billion euro annually in 2014-2016. A part of the incoming dividends are used for new loans and investments. The incoming and outgoing royalty flows are 26 and 28 billion euro on average in 2014-2016.

Bermuda is the most important destination for royalty and interest flows. The flows come from Ireland, Singapore and the United States. For interest flows, the geographical distribution is somewhat broader. About half of the dividends goes to multinationals in the US, UK or Switzerland. Other destinations are other European countries and some tax havens. The source of dividend is really multilateral: from Europa, North and South America, Asia and Oceania. Also for these flows various tax havens are involved as recipient or sender of these flows. This suggests that the diversion of income flows does not involve only one country but several ones, see also Hong (2018) and Van ‘t Riet and Lejour (2018).

We find a substantial tax reduction for royalties by using Dutch SPEs. The total tax expense, including withholding taxes, is on average lower for the indirect route compared to the direct route. The total tax expense using the indirect route is also lower than the corporate income tax rate in the host country. However, with our method using statutory tax rates, we cannot find substantial tax savings for dividends and interest. For dividends, the weighted average total tax expense is actually higher for the indirect route via the Netherlands than for the direct route.

When we control for other (bilateral) country characteristics in a regression analysis, we do find that for all three income types, tax parameters are relevant for explaining the geographical pattern of flows via Dutch SPEs. A treaty shopping gain increases the probability that the indirect route via the Netherlands is used. An increase in the tax differential of the direct route and the indirect route also increases the expected size of the flow via Dutch SPEs.

From a policy perspective, it would be interesting to repeat this analysis within a few years when the anti-tax-avoidance policy measures are implemented. Examples are the European ATAD1 and 2 directives, action 6 of the BEPS report on the abuse of treaty shopping and the conditional withholding taxes on royalty and interest flows in the Netherlands. All these measures could change the landscape of tax avoidance and SPEs. The possible impact of these measures could learn us a lot from the response of multinationals firms to changing tax incentives.

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Appendix A: Assets and liabilities

Table A.1 Categories of assets and liabilities

Assets	Liabilities
Affiliates	Equity (major shareholders)
Affiliates >= 10%	Major shareholders >= 10%
Affiliates < 10%	Major shareholders < 10%
Affiliates in mother	Major shareholders (daughter)
Debt (including bonds)	Debt
Other loans	Other loans
Listed bonds	
Other assets	Other liabilities (including bonds)
Listed shares	Listed shares
Derivatives	Derivatives
Real estate	Listed bonds
Firm resources	
Goodwill	
Licenses and permits	
Other immaterial assets	
Patents	

Table A.2 Categories of incoming and outgoing flows

Incoming	Outgoing
Dividends from affiliates	Dividends to affiliates
From affiliates >= 10%	To major shareholders >= 10%
From affiliates < 10%	To major shareholders < 10%
From affiliates in mother	To major shareholders (daughter)
Interest from other loans	Interest on other loans
Other loans	Interest on other loans
Royalties	Royalties
Incoming royalties	Outgoing royalties
Other income	Other costs
Dividends from listed shares	Dividends on listed shares
Interest from listed bonds	Interest on listed bonds
Other income	Other costs
Result on real estate	

Appendix B: Alternative allocation

Section 2.2 explains the allocation of bilateral flows. That allocation is based on the minimum of total incoming and total outgoing income of a cluster of SPEs. As an alternative, we base the allocation on the maximum:

$$F_{io,xy} = \frac{I_{t=i,x}}{TI}\frac{O_{t=o,y}}{TO}\max(TI, TO)$$

where $F_{io,xy}$ is the calculated flow of type i from country x to country y as type o, $I_{t=i,x}$ is the incoming flow of type i from country x, $O_{t=o,y}$ is the outgoing flow of type o to country y, TI is the total incoming flow of the cluster from all countries and in all types and TO is the total outgoing flow of the cluster to all countries and in all types. Subscripts for time and clusters are omitted. The left part of the equation gives a fraction of the total flow of the cluster that we allocate to the flow between country x and y as type i to type o. We only take into account positive incoming and outgoing flows and we ignore negative flows. After calculating the bilateral primary income flows, we determine the aggregates between two countries by summing over all clusters. Table B.1 shows the assigned primary income flows, by type averaged over 2014-2016.

Table B.1 Alternative assigned primary income flows, by type in 2014-2016 (x billion euros)

To: / From:	Dividend	Interest	Royalties	Other	To NL / retained	Total
Dividend	53.8	11.7	11.0	12.0	-11.4	76.9
Interest	10.5	5.6	1.7	10.4	-5.1	23.1
Royalties	3.0	0.4	22.4	0.6	-0.5	25.9
Other	1.3	0.4	0.3	1.4	-1.1	2.3
From NL / retained	-17.1	-9.0	-7.4	-6.4		
Total	51.4	9.0	28.0	18.0	106.4	128.1

Appendix C: Tax havens

Table C.1 Tax haven list

Country	CIT rate(%)	Country	CIT rate (%)
Andorra		Liechtenstein	12.5
Anguilla		Luxembourg	27.8
Antigua and Barbuda		Macao	12
Aruba	25	Maldives	
Bahamas	0	Malta	35
Bahrain	46	Marshall Islands	
Barbados	25	Mauritius	15
Belize		Monaco	
Bermuda	0	Montserrat	
British Virgin islands	0	Naura	
Cayman Islands	0	Netherlands Antilles	
Cook Islands		Niue	
Costa Rica	30	Panama	25
Cyprus	12.5	Saint Kitts and Nevis	
Dominca		Saint Lucia	
Gibraltar		Samoa	
Grenada		San Marino	
Guernsey	0	Seychelles	30
Hong Kong	16.6	Singapore	17
Ireland	12.5	St Vincent and the Grenadines	
Isle of Man	0	Switzerland	21.1
Jersey	0	Tonga	
Jordan	20	Turks and Caicos Islands	
Libanon	15	Vanuatu	
Liberia		Virgin Islands US	38.5

The table gives the Gravelle (2013) list of 50 tax havens. The intersection with our selection of 108 jurisdictions is marked by the CIT rates in the table. This gives 26 countries. Some countries are in our selection but are not on the Gravelle list. Two examples are the United Arab Emirates (0%) and Puerto Rico (20%). Observe that we have taken a single, headline nominal CIT rate for each country.

Appendix D: coefficients estimates of the gravity variables

Table D.1 Summary statistics for the gravity variables in the regressions averaged 2014-2016

Gravity variables	Obs.	Mean	Standard deviation	Min	Max
Ln(GDP in euro)	106	25.27	2.05	20.59	30.42
Ln(distance in km)	11130	8.626	0.896	1.54	9.89
Common language (dummy)	11130	0.136	0.343	0	1
Colony (dummy)	11130	0.017	0.128	0	1

The gravity variables have a similar role as in other studies. A larger economy of the host and home country of investment increases the probability of a primary income flow via a Dutch SPE and also larger flows. Distance between these two countries has a negative effect on the probability of the flow and its size. A common language increases the possibility of a SPE in the Netherlands, but is not statistically significant. A former colonial relation between both countries has a significant positive effect on the probability of a flow and also on the size of the flow.

Table D.2 Explaining bilateral dividend flows using tax variables for 2014 to 2016 (gravity part)

Bilateral dividend flows	(1)	(2)	(3)	(4)	(5)
Estimation method	Probit	probit	ols>0	ppml	ols
Ln(GDP) host country	0.222***	0.0223***	0.455***	0.542***	0.171***
	(0.0132)	(0.00132)	(0.0680)	(0.0802)	(0.0111)
Ln(GDP) home country	0.420***	0.0420***	0.753***	1.081***	0.356***
	(0.0144)	(0.00147)	(0.0692)	(0.0949)	(0.0149)
Ln(distance)	-0.275***	-0.0275***	-0.428***	-0.450***	-0.261***
	(0.0219)	(0.00219)	(0.0932)	(0.119)	(0.0260)
Common language dummy	0.0630	0.00631	-0.114	0.491	0.0554
	(0.0645)	(0.00646)	(0.337)	(0.353)	(0.0575)
Former colony dummy	0.433***	0.0434***	0.705	0.476	1.019***
	(0.115)	(0.0115)	(0.460)	(0.337)	(0.272)

Note: see notes Table 5.2.

Table D.3 presents the results of the same set of regressions for bilateral interest flows via the Netherlands. The coefficient for a common language is positive and statistically significant in the probit and OLS regressions.

Table D.3 Explaining bilateral interest flows using tax variables for 2014 to 2016 (gravity part)

Bilateral interest flow	(1)	(2)	(3)	(4)	(5)
Estimation method	probit	probit	ols>0	ppml	ols
Ln(GDP) host country	0.345***	0.0686***	0.351***	0.584***	0.278***
	(0.0105)	(0.00183)	(0.0329)	(0.0694)	(0.00943)
Ln(GDP) home country	0.364***	0.0724***	0.428***	0.754***	0.310***
	(0.0106)	(0.00182)	(0.0331)	(0.154)	(0.0103)
Ln(distance)	-0.180***	-0.0358***	-0.502***	-0.416**	-0.225***
	(0.0172)	(0.00337)	(0.0495)	(0.168)	(0.0202)
Common language dummy	0.101**	0.0201**	0.399***	0.559	0.167***
	(0.0474)	(0.00942)	(0.137)	(0.515)	(0.0480)
Former colony dummy	0.506***	0.101***	0.793***	0.321	1.059***
	(0.104)	(0.0206)	(0.261)	(0.404)	(0.200)

Note: see notes Table 5.2.

Table D.4 Explaining bilateral royalty flows using tax variables for 2014 to 2016 (gravity part)

Bilateral royalty flows	(1)	(2)	(3)	(4)	(5)
Estimation method	Probit	probit	ols>0	ppml	ols
Ln(GDP) host country	0.380***	0.0580***	0.436***	1.117***	0.263***
	(0.0122)	(0.00162)	(0.0481)	(0.231)	(0.0102)
Ln(GDP) home country	0.487***	0.0742***	0.333***	0.746***	0.295***
	(0.0133)	(0.00167)	(0.0517)	(0.179)	(0.0103)
Ln(distance)	-0.129***	-0.0196***	-0.0688	0.342	-0.0841***
	(0.0197)	(0.00300)	(0.0598)	(0.290)	(0.0183)
Common language dummy	-0.101*	-0.0154*	0.683***	3.593***	0.0907*
	(0.0591)	(0.00901)	(0.242)	(0.479)	(0.0482)
Former colony dummy	0.195*	0.0297*	0.507	-1.094*	0.490***
	(0.113)	(0.0173)	(0.358)	(0.563)	(0.184)

Note: see notes Table 5.2.

Appendix E: Pooled regressions for bilateral flows

Table E.1 Explaining bilateral dividend flows using tax variables for 2005 to 2016

Bilateral Interest flow	(1)	(2)	(3)	(4)	(5)
Estimation method	Probit	Prob	ols>0	ppml	Ols
Ln(GDP) host country	0.245***	0.0230***	0.417***	0.569***	0.179***
	(0.00690)	(0.000648)	(0.0360)	(0.0469)	(0.00566)
Ln(GDP) home country	0.446***	0.0419***	0.630***	0.942***	0.345***
	(0.00763)	(0.000725)	(0.0387)	(0.0452)	(0.00718)
Ln(distance)	-0.279***	-0.0262***	-0.572***	-0.523***	-0.271***
	(0.0113)	(0.00106)	(0.0487)	(0.0646)	(0.0132)
Common language dummy	-0.0305	-0.00287	0.0995	0.720***	0.0334
	(0.0348)	(0.00327)	(0.184)	(0.213)	(0.0274)
Former colony dummy	0.472***	0.0445***	1.063***	0.876***	1.125***
	(0.0581)	(0.00546)	(0.245)	(0.258)	(0.142)
Tax haven host country	0.277***	0.0261***	1.257***	1.400***	0.284***
	(0.0331)	(0.00311)	(0.166)	(0.237)	(0.0241)
Tax haven home country	1.168***	0.110***	2.252***	1.841***	0.884***
	(0.0328)	(0.00304)	(0.184)	(0.157)	(0.0266)
Treaty shopping gain (bilateral)	1.147***	0.108***	-0.499	3.060***	0.704***
	(0.0915)	(0.00864)	(0.429)	(0.506)	(0.0820)
Year dummy 2008-2010	0.147***	0.0139***	0.168	0.407*	0.0706***
	(0.0328)	(0.00308)	(0.162)	(0.210)	(0.0235)
Year dummy 2011-2013	-0.0621*	-0.00584*	0.739***	0.129	-0.0579**
	(0.0327)	(0.00308)	(0.156)	(0.224)	(0.0245)
Year dummy 2014-2016	-0.159***	-0.0150***	0.0184	-0.436**	-0.155***
	(0.0330)	(0.00311)	(0.159)	(0.214)	(0.0239)
Constant	-17.21***		-17.15***	-28.33***	-10.52***
	(0.303)		(1.528)	(1.704)	(0.262)
Observations	44,520	44,520	3,024	44,520	44,520
R-squared	0.307		0.158	0.069	0.144

Notes: Robust standard errors are in parentheses, *** p<0.01, ** p<0.05, * p<0.1. Columns (1) and (2) present the results of the probit regressions with the estimated coefficients and marginal effects, respectively. The dependent variable is 1 if there is a Dutch SPE and 0 otherwise. Column (3) presents the results for the OLS regression with positive income flows as dependent (intensive margin). Columns (4) and (5) present the results for the PPML and OLS regression on zero and positive income flows. The data are pooled into 4 three year averages, 2005-2007, 2008-2010, 2011-2013 and 2014-2016.

Table E.2 Explaining bilateral interest flows using tax variables for 2005 to 2016

Bilateral dividend flows	(1)	(2)	(3)	(4)	(5)
Estimation method	prob	prob	Ols>0	ppml	ols
Ln(GDP) host country	0.359***	0.0722***	0.409***	0.687***	0.311***
	(0.00533)	(0.000925)	(0.0174)	(0.0397)	(0.00504)
Ln(GDP) home country	0.369***	0.0742***	0.529***	0.844***	0.342***
	(0.00535)	(0.000921)	(0.0166)	(0.0581)	(0.00544)
Ln(distance)	-0.258***	-0.0520***	-0.618***	-0.661***	-0.327***
	(0.00849)	(0.00167)	(0.0238)	(0.0708)	(0.0110)
Common language dummy	-0.0449*	-0.00903*	0.480***	0.106	0.0860***
	(0.0247)	(0.00497)	(0.0783)	(0.199)	(0.0245)
Former colony dummy	0.401***	0.0807***	0.884***	1.081***	1.069***
	(0.0521)	(0.0105)	(0.136)	(0.220)	(0.108)
Tax haven host country	0.586***	0.118***	0.936***	0.898***	0.562***
	(0.0234)	(0.00462)	(0.0740)	(0.189)	(0.0204)
Tax haven home country	1.093***	0.220***	2.069***	2.250***	1.051***
	(0.0232)	(0.00433)	(0.0679)	(0.136)	(0.0229)
Direct tax gain (bilateral)	0.250***	0.0503***	-0.430*	-1.114	0.163***
	(0.0681)	(0.0137)	(0.248)	(0.699)	(0.0566)
Treaty shopping gain (bilateral)	1.552***	0.313***	4.159***	7.280***	1.511***
	(0.121)	(0.0242)	(0.409)	(0.849)	(0.124)
Year dummy 2008-2010	0.0299	0.00602	0.264***	0.229	0.0596***
	(0.0223)	(0.00450)	(0.0638)	(0.215)	(0.0213)
Year dummy 2011-2013	-0.302***	-0.0607***	-0.137**	-0.471**	-0.245***
	(0.0228)	(0.00457)	(0.0675)	(0.208)	(0.0213)
Year dummy 2014-2016	-0.410***	-0.0825***	-0.519***	-0.908***	-0.390***
	(0.0231)	(0.00461)	(0.0676)	(0.253)	(0.0209)
Constant	-17.34***		-16.57***	-29.55***	-13.07***
	(0.215)		(0.646)	(1.793)	(0.211)
Observations	44,520	44,520	8,921	44,520	44,520
R-squared	0.281		0.230	0.118	0.245

Notes: see notes Table E.1.

Table E.3 Explaining bilateral royalty flows using tax variables for 2005 to 2016

Bilateral royalty flows	(1)	(2)	(3)	(4)	(5)
Estimation method	Prob	prob	Ols>0	ppml	ols
Ln(GDP) host country	0.397***	0.0710***	0.383***	1.093***	0.258***
	(0.00572)	(0.000858)	(0.0178)	(0.140)	(0.00447)
Ln(GDP) home country	0.470***	0.0840***	0.328***	0.763***	0.289***
	(0.00603)	(0.000861)	(0.0192)	(0.109)	(0.00478)
Ln(distance)	-0.109***	-0.0195***	-0.0934***	0.253*	-0.0779***
	(0.00927)	(0.00165)	(0.0232)	(0.140)	(0.00819)
Common language dummy	-0.0746***	-0.0134***	0.684***	3.393***	0.110***
	(0.0275)	(0.00492)	(0.100)	(0.322)	(0.0225)
Former colony dummy	0.164***	0.0293***	0.300**	-0.379	0.411***
	(0.0549)	(0.00981)	(0.145)	(0.338)	(0.0846)
Tax haven host country	0.371***	0.0663***	0.797***	6.212***	0.387***
	(0.0252)	(0.00448)	(0.0826)	(0.858)	(0.0183)
Tax haven home country	0.749***	0.134***	1.768***	3.083***	0.654***
	(0.0249)	(0.00431)	(0.0771)	(0.407)	(0.0181)
Direct tax gain (bilateral)	1.106***	0.198***	-0.684**	-0.895	0.495***
	(0.0779)	(0.0138)	(0.273)	(1.809)	(0.0482)
Treaty shopping gain (bilateral)	1.882***	0.337***	5.536***	27.57***	1.273***
	(0.124)	(0.0219)	(0.471)	(3.735)	(0.116)
Year dummy 2008-2010	-0.422***	-0.0755***	-0.181***	1.235*	-0.202***
	(0.0239)	(0.00424)	(0.0589)	(0.750)	(0.0165)
Year dummy 2011-2013	-0.420***	-0.0751***	0.0797	1.419*	-0.182***
	(0.0231)	(0.00410)	(0.0593)	(0.774)	(0.0186)
Year dummy 2014-2016	-0.911***	-0.163***	0.510***	1.387**	-0.331***
	(0.0253)	(0.00434)	(0.0764)	(0.654)	(0.0187)
Constant	-21.82***		-15.71***	-53.02***	-12.52***
	(0.247)		(0.729)	(6.867)	(0.193)
Observations	44,520	44,520	8,562	44,520	44,520
R-squared	0.351		0.177	0.193	0.211

Notes: see notes Table E.1.